

*III Edition of Epistemological Perspectives on Simulation
A Cross-Disciplinary Workshop*

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Some epistemological questions for participatory simulations

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Outline

- Introduction on participatory modeling
- A focus on companion modelling:
 - The initial scientific question
 - The theoretical foundations
 - Commod approach
 - Issues
 - Dialog and power
 - Evaluation

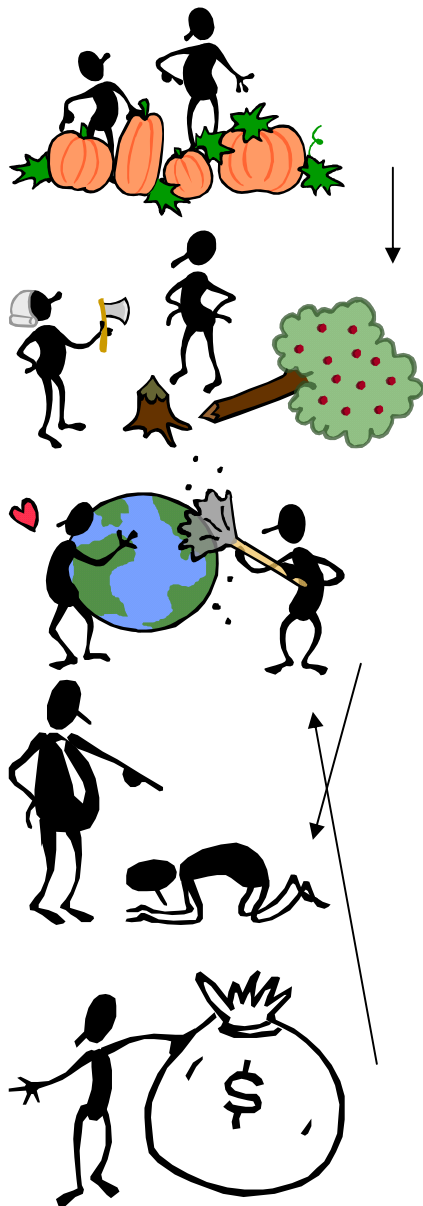
Different objectives for participatory simulation

- Pretty (1995) :
 - Passive participation (just inform people)
 - Extract information from people (no influence on the diagnostic)
 - Participation for application of decisions
 - Interactive participation
 - Self organization
- Lynam (2007)
 - (A) Extractive use, in which knowledge, values, or preferences are synthesized by the extracting group and passed on as a diagnosis to a decision-making process.
 - (B) Co-learning, in which syntheses are developed jointly and the implications are passed to a decision-making process.
 - (C) Co-management, in which the participants perform the syntheses and include them in a joint decision-making process.

Companion modelling

Some history

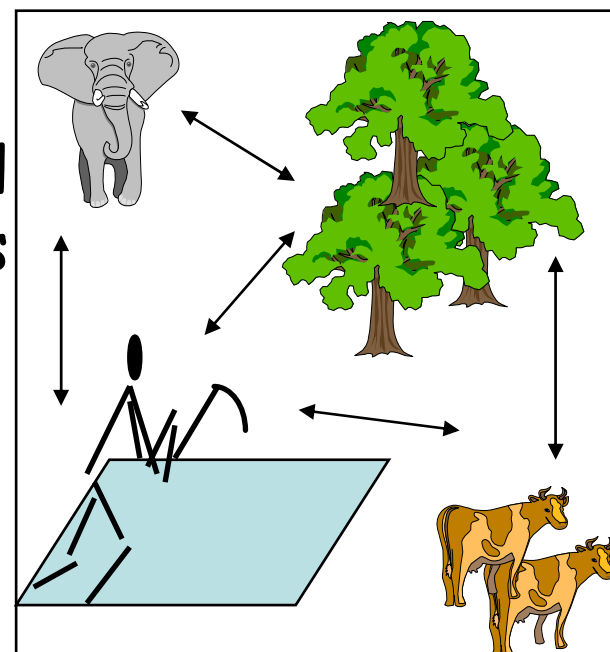
- 1993, creation of Cirad-Green team (Renewable resource management, environment), J.Weber
- Theme : Interaction between renewable resource dynamics and decision-making process (process of interaction among stakeholders having different representations and different weights)
- Use of the MAS method for modelling & simulation



Social
Dynamics

Biological
Dynamics

Interactions and
Points of view



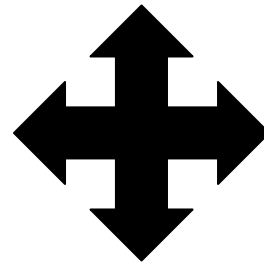
Our experience

Artificial societies
Theory building

Usefulness?

Applied models
*Understanding by
knowledge
and data integration*

Genericity?



**Platform
implementation**
*Concrete capitalization,
Improving the methodology*

Companion modelling
Using the models to help collective management

Is this science ?

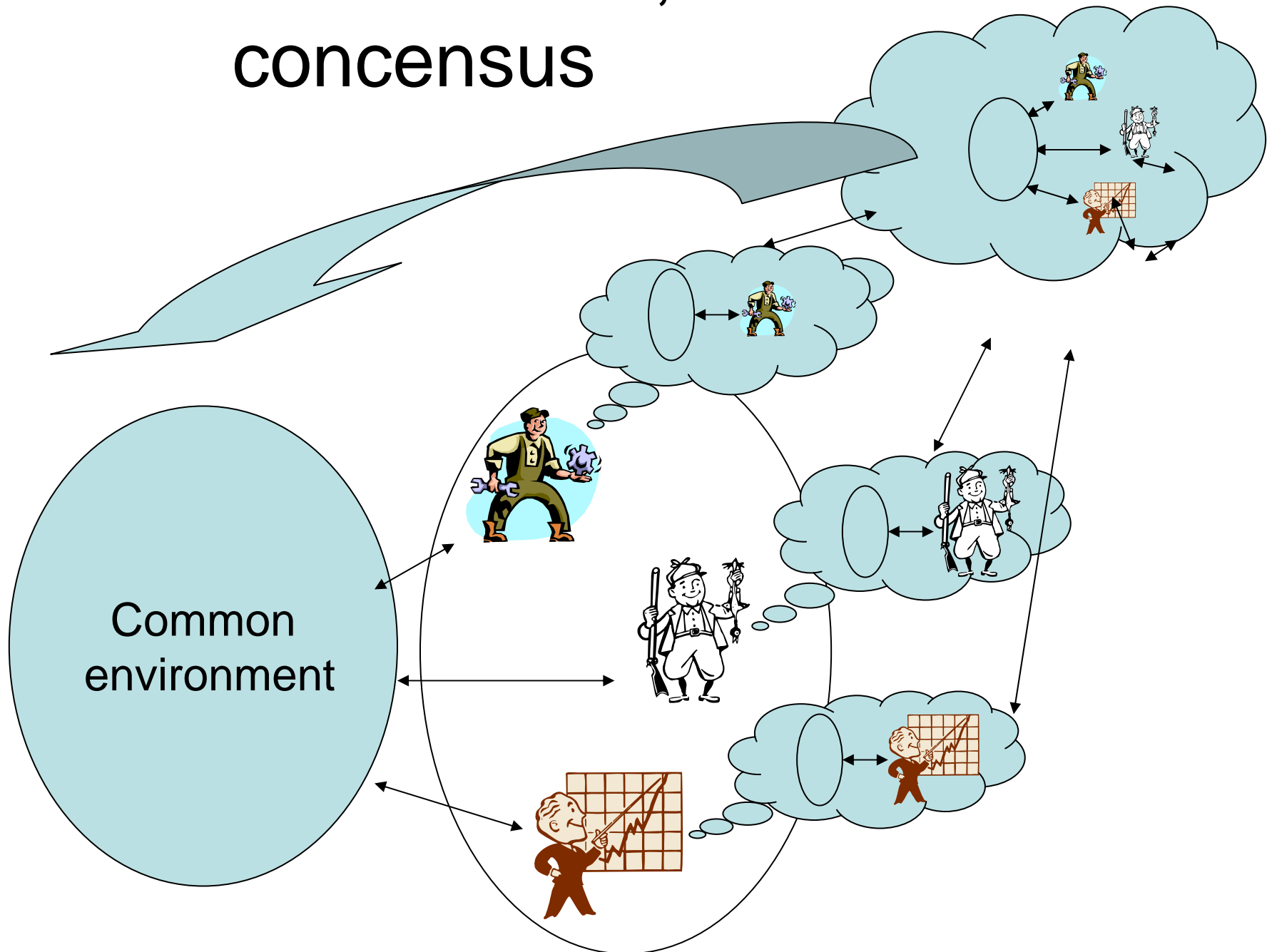
Simulation and adaptive management: Companion modelling

- In 1996, proposal of an approach for the use of simulation models: from consensus among researchers to consensus among stakeholders,
- Tools proposed: Role games and multi-agent systems for a common representation of the system
 - to increase knowledge on system dynamics
 - to facilitate the use of the MAS model by stakeholders
 - to validate the model
 - to simulate and to assess scenarios of changes with them for collective decision making
- 1998, first experiment in Sénégal (Barreteau), followed by many others (Sénégal, France, Vietnam, Thailand, Bhutan, The Philippines, Brasil, Kiribati, South Africa)

Theoretical foundations

- Science of complexity, life at the edge of chaos: transitions between organizations
- Constructivism, consensus
- Situated action
- Post-normal science
- Resilience, adaptive management

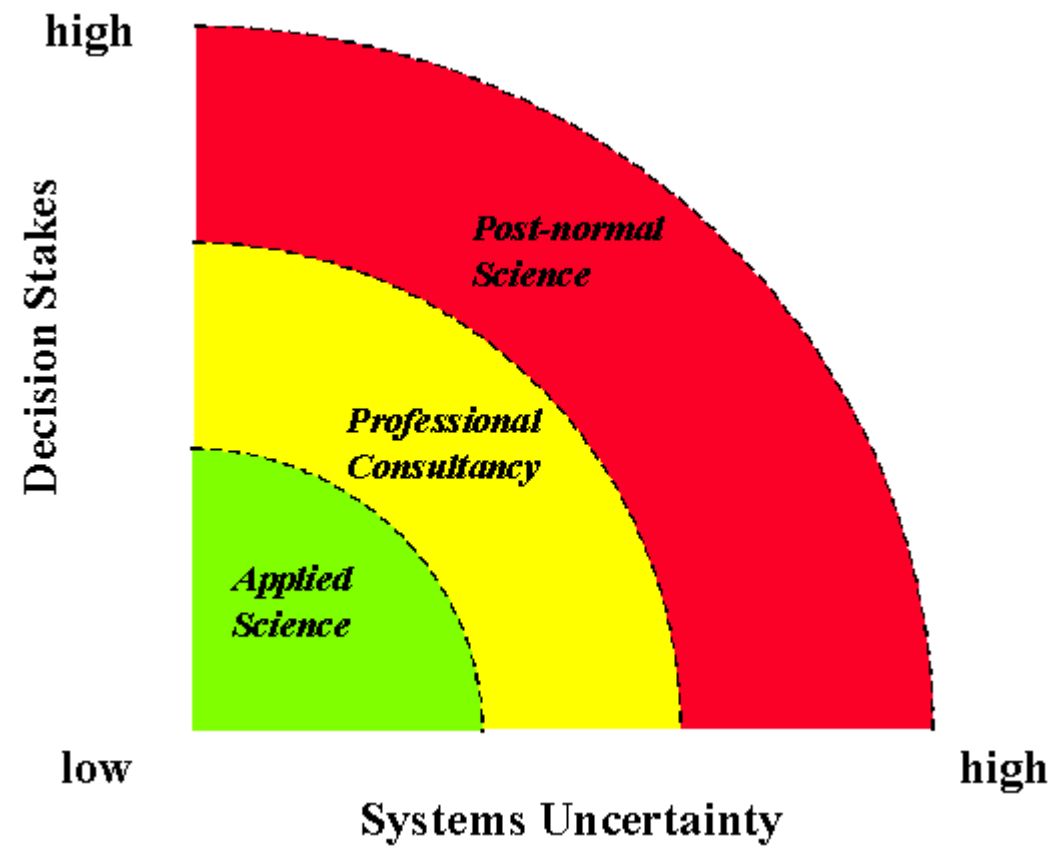
Constructivism, consensus



Situated action

- Any action depends on the material and social context. The objective is to understand how the individual decides in action
- For collective action, requires the use of intermediary (mediator) objects. These objects do not only reveal, they also transform the system

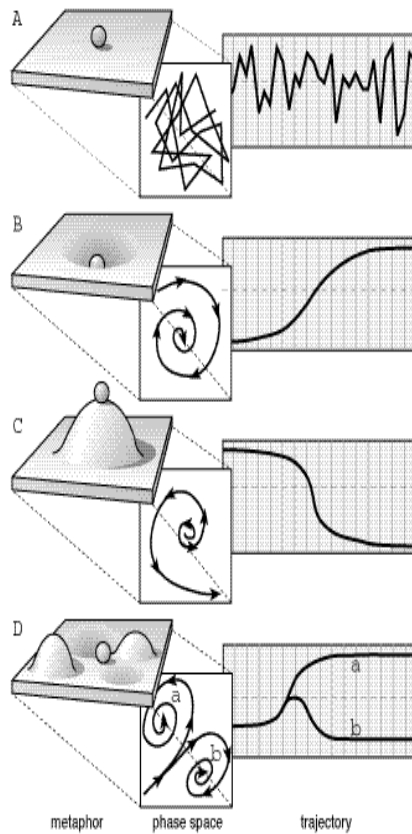
Post normal science



Post normal science

- The quality of the decision on a complex system = the quality of the process which leads to the decision.
- The quality of the process depends on the dialog between actors, to check the acceptability of the decisions but also to co-design these decisions

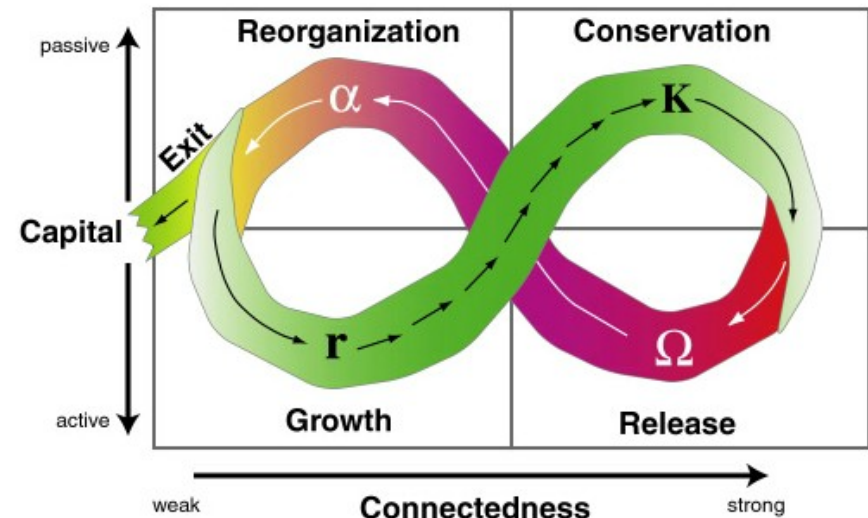
Resilience



	Stability	Processes	Policies	Consequence
Nature flat	None	Stochastic	Random	Trial and error
Nature balanced	Globally stable	Negative feedback	Optimize or return to equilibrium	Pathology of surprise
Nature anarchic	Globally instable	Positive feedback	Precautionary principle	Status quo
Nature resilient	Multiple stable states	Exogenous input and internal feedback	Maintain variability	Recovery at local scales or adaptation
Nature evolving	Shifting stability landscape	Multiple scales and discontinuous structures	Flexible and adaptive, probing	Active learning and new institutions

Adaptive cycle

- Y axis = potential, ex : the accumulated resources of biomass and nutrients
- X axis = degree of connectedness among controlling variables
 - Low connectedness -> diffuse elements loosely connected whose behavior is dominated by outward relations and affected by outside variability.
 - High connectedness -> aggregated elements whose behavior is dominated by inward relations among elements of the aggregates, relations that control or mediate the influence of external variability



Four distinct stages

- growth or exploitation (r)
- conservation (K)
- collapse or release (Ω)
- reorganization (α)

Resilience & adaptive capacity

- Folke et al. (2002) identify and expand on four critical factors that interact across temporal and spatial scales and that seem to be required for dealing with natural resource dynamics during periods of change and reorganization:
 - learning to live with change and uncertainty;
 - nurturing diversity for resilience;
 - combining different types of knowledge for learning; and
 - creating opportunity for self-organization towards social-ecological sustainability.

Companion modelling

- Principles: the posture
- Methodology and tools

Support for collective decision-making processes

- Companion modelling comes into play upstream of the technical decision. It guides the discussions of the various stakeholders involved, with a view to producing a shared representation of the problem, and identifying effective ways of dealing with it.
- When facing a complex situation, the decision-making process is adaptive. This means that the process always produces imperfect “decisions”, but following each iteration they are less imperfect and more widely shared
- The question is not the quality of the choice, but the quality of the process leading up to it. It is not about finding the best solution, but about examining the uncertainties of the situation with as much clarity as possible

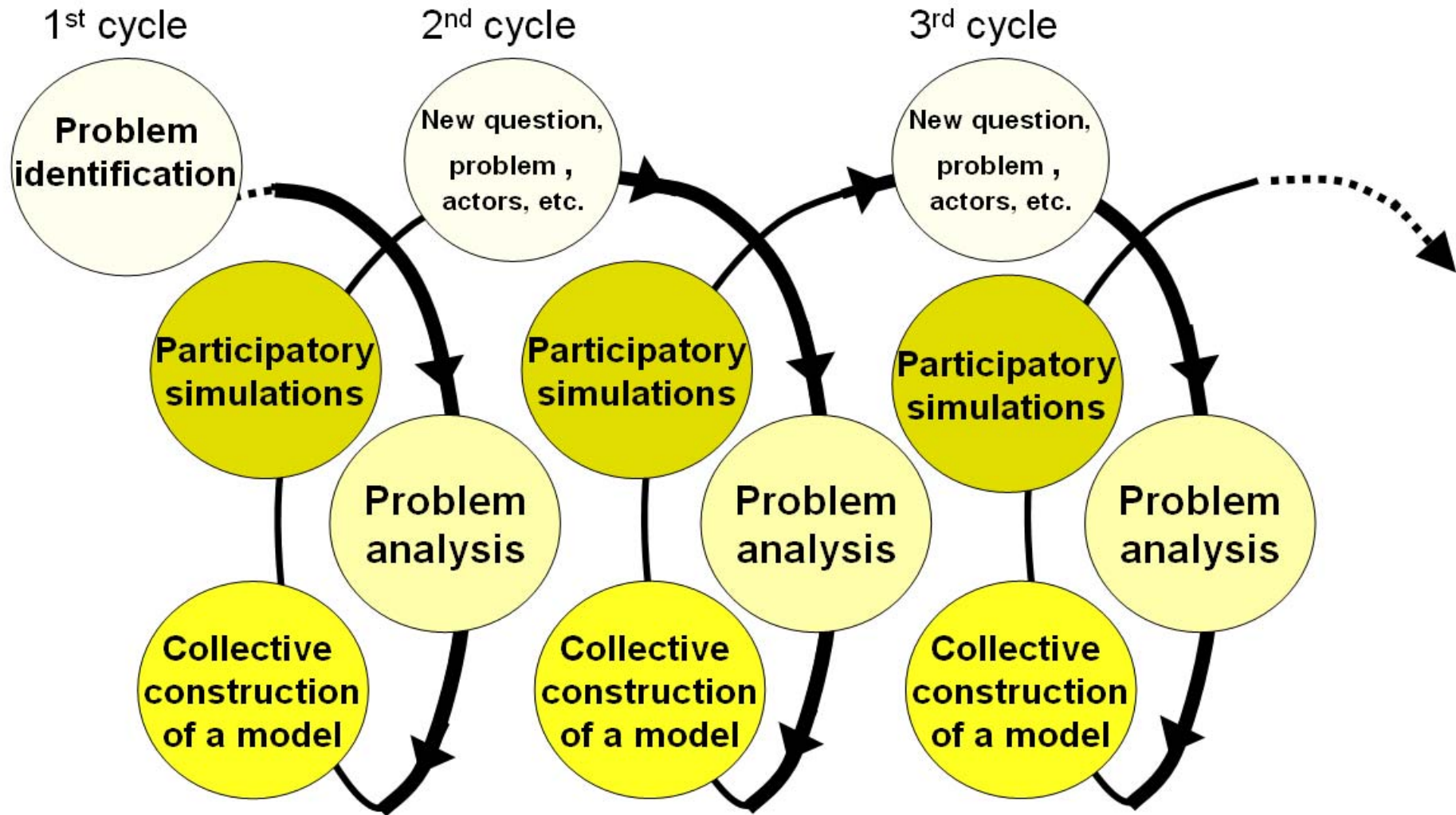
ComMod posture (Jasss)

- Mediated by models: facilitate interdisciplinarity, knowledge integration, collective thought, learning & exchanges,
- To dialog & agree upon on desirable long term objectives
- To explore/assess possible scenarios to get there
- To identify needs for technological & organizational innovations
- Principle of transparency of the underlying assumptions
- Two specific objectives:
 - ComMod to understand
 - ComMod to facilitate management of renewable resources
- Applications
 - Sénégal, Bhutan, France : conflict résolution, output = formal modification of the system, clear influence of the comMod approach
 - Many places : collective learning, no evidence of change in management
 - Some places : collective learning, change in management, no proof of ComMod influence

Framework (adaptive)

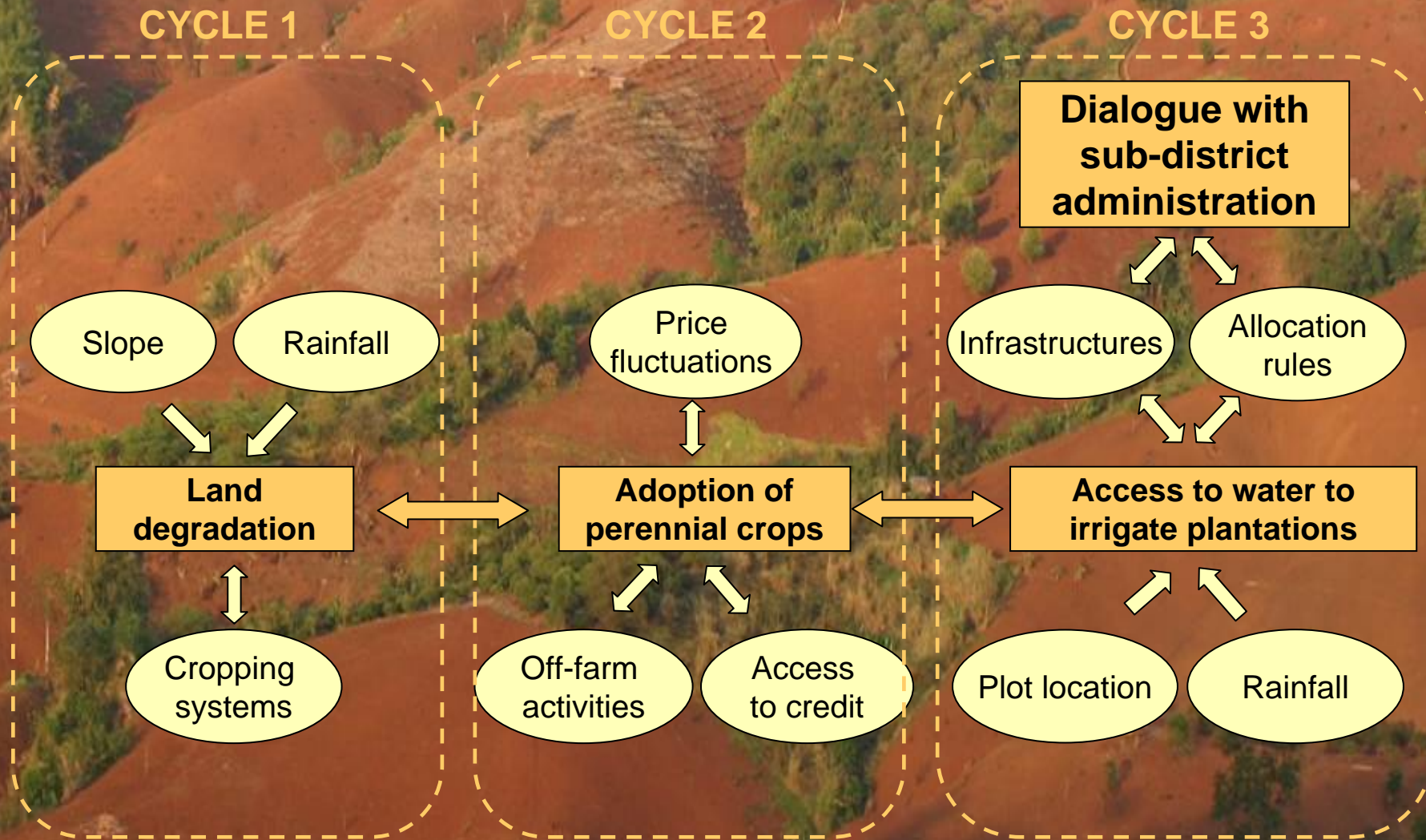
1. Synthesis of available knowledge, analysis of institutional context
2. Conceptualization of a model
 - From theoretical models
 - From the scientist model
 - From typologies collectively created (original work of N. Becu),
3. Implementation of the model
4. Participatory workshop for validation (of the micro-macro link), visioning and decisions
 - Role playing game and/or computer simulations
 - Collective & individual interviews
 - Assessment of simulated scenarios (MAS)

An iterative process

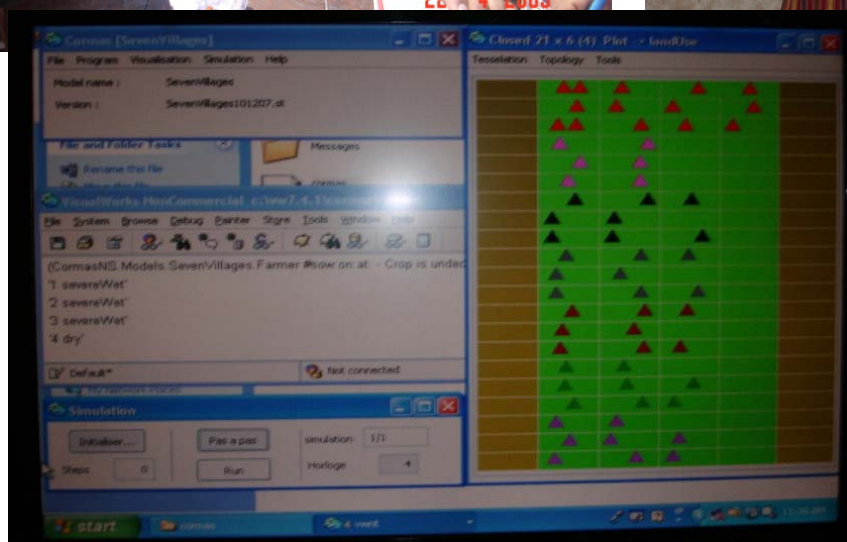




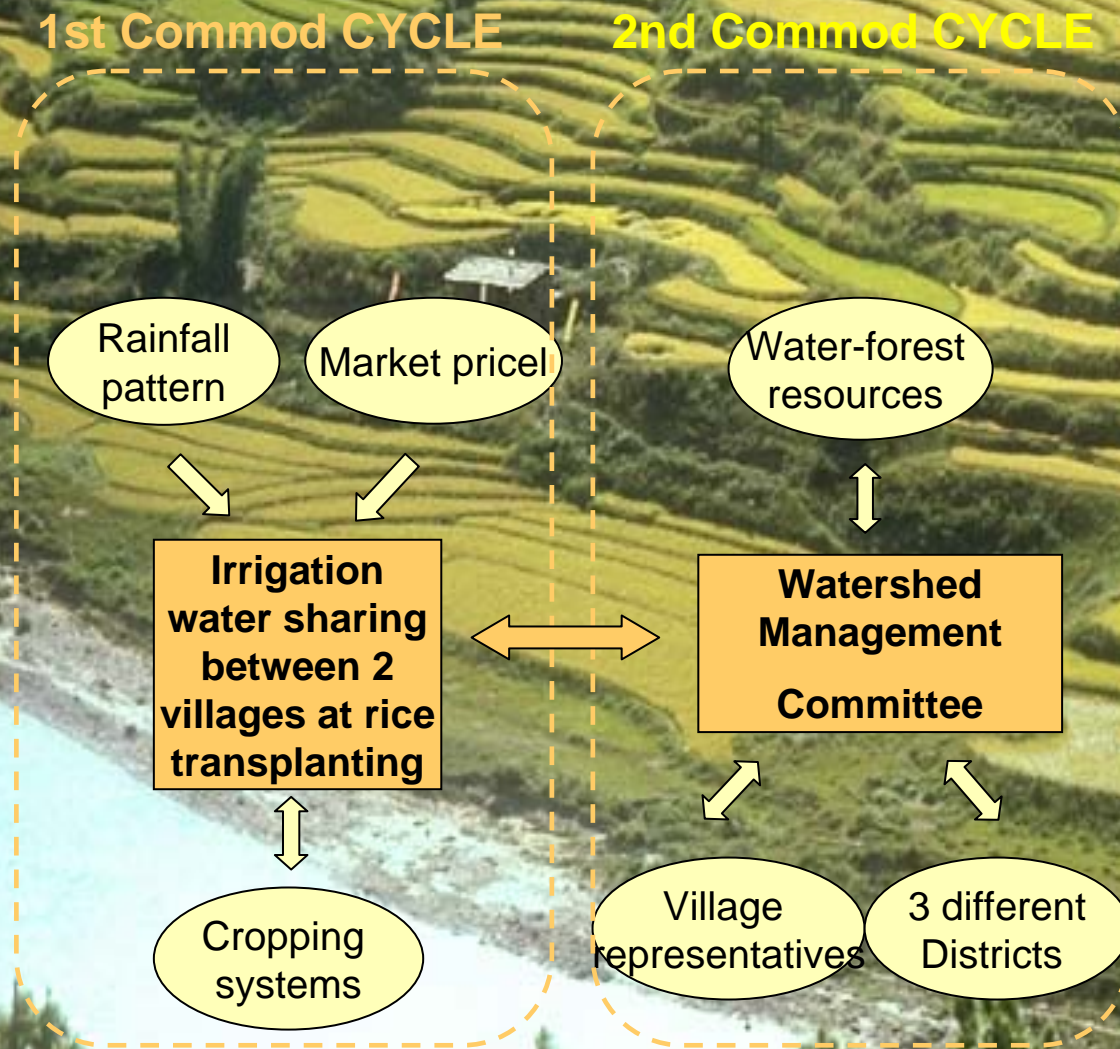
Evolution of the NRM question: from soil erosion to perennial crops to water use / sharing



→ Adjustment of Role-Playing Game and computer models to new focus



2nd Commod Cycle: resource management problem & main interacting facets



Design of a new Role-Playing Game adapted to the 7 village context

Issues and on-going research

- Assumption: Consensus for a group (Becker et al., Schmid)
- Dialogue and power: soft-systems vs critical learning system approach .
 - Open the dialog (Habermas)
 - Take into account power relationships, differences in knowledge, status (Ulrich)
 - The strategic approach: to manipulate the consensus
- Towards equitable dialogue: to enhance the chance of each stakeholder to express his/her point of view
 - Ex SugarRice model

Issues and on-going research

- Understanding the social context and the social dynamics,
- Can the changes be related to the Commod approach and the use of simulation?

Assessment in Bhutan J. Queste, sociologist

- Problem shift:
 - Commod workshops evolved from “equitable water sharing” to “better water management”
The change of problem, has two direct consequences: it emphasizes the need for collective planning and actions and it implies to reconsider the actors involved. Sharing water involved only 2 villages. Managing the watershed involves all the beneficiaries: the 7 villages.

Assessment in Bhutan

- Social interactions:
 - Creation of a watershed committee. The link between Commod activities and the creation of this committee is however ambiguous. Is this success to be attributed to RPGs, multi-agent simulations and focus groups? Or did other strategic interests and the persuasion of some influential actors play a key role? Three factors contributed to the successful creation of this committee:
 1. A favourable situation: A national policy of decentralization, funding to initiate the project, a common good that make sense, a geographic, social and ethnical entity, infrastructure allowing regular meetings, and a sense of urgency (with messages from the authorities like you solve your problems by yourself or we intervene to impose rules!), etc.
 2. An upscaling process toward the emergence is a common interest to all villages and to the research center. The Bajo RNR-RC fulfilled its objective of collective organization. The villages were convinced of the benefits of collective action and of their interest in establishing a common discussion platform: Together, we can better manage the resource and get more funding,
 - 3 Some “entrepreneurial” activities from influential actors and strategic actions helped initiate the project.

Issues and on-going research

- Did people learn? What did they learn?
- How do we know which technique is useful for such context/issue?

Commod assessment project

- Lack of shared assessment methodology
- 25 cases selected
- Common description framework
- Assessment protocol focusing on learning

Designer/Participants questionnaire

- **Initial Context Table:** captures the designers' initial perceptions of the physical and socio-political context
- **Method & tool Table:** What outcomes were expected in terms of:
 - Learning
 - New relations
 - New practices within the group
 - New practices outside the group
- What was achieved in terms of:
 - Learning
 - New relations
 - New practices within the group
 - New practices outside the group.
- **Contextual Change Table:** records how the context changed over the life of the project.

Synthesis of the case studies

Consider the outputs in terms of

- (K) Knowledge, (I) interaction, (P) perception, (a) action, and (E) exchange
- With:
 - The context, the initial objectives, the intervention of facilitators, the type of exchange, the simulation outputs

Knowledge synthesis

Sensitizing

Field survey

Conception of the model

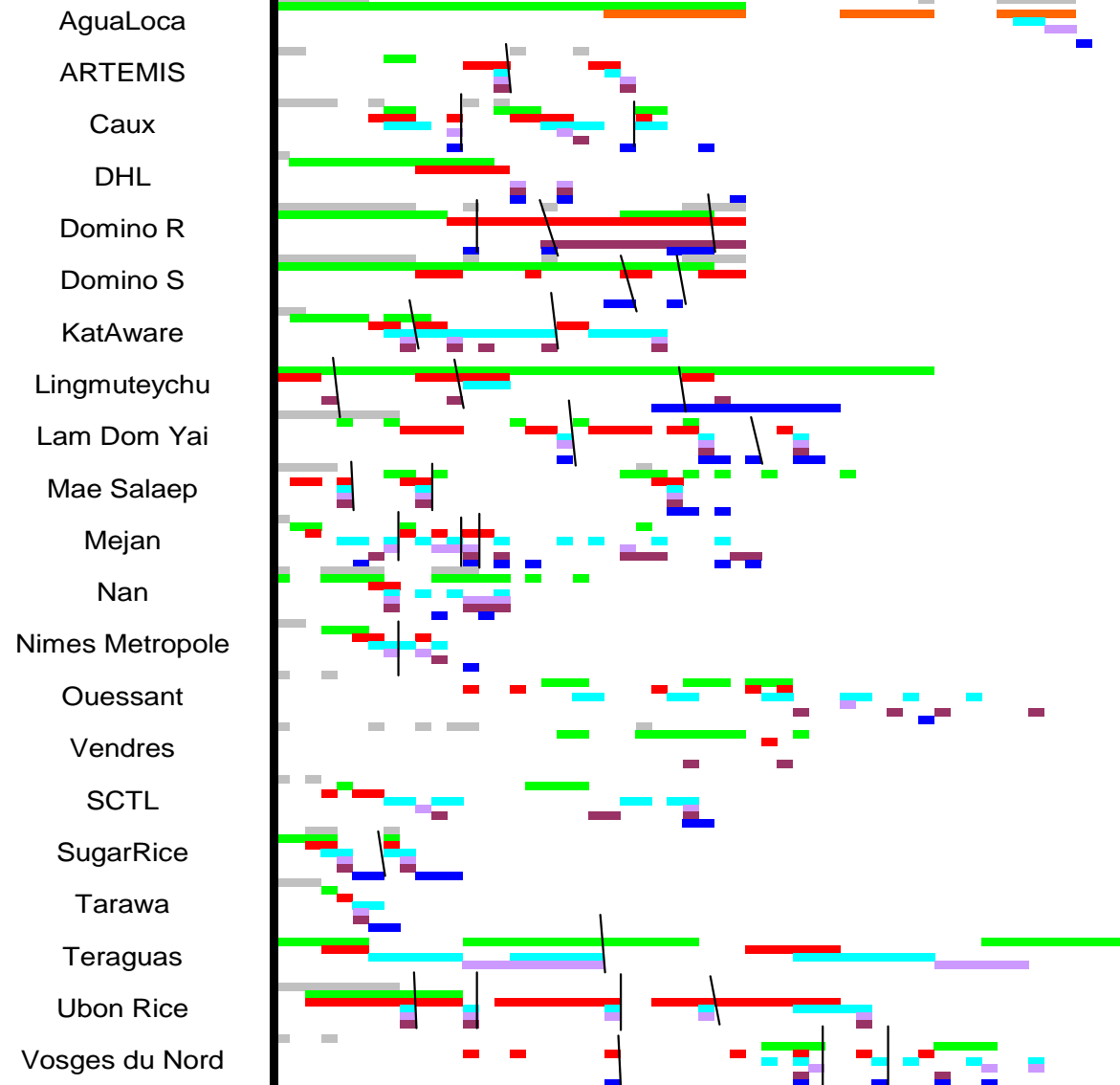
Implementation of RPG
& of associated MAS model

Test & validation of the RPG
& MAS model

Scenario simulation
& assessment

Feedback to stakeholders

Monitoring & evaluation



Conclusion on some epistemological thoughts

- Companion modelling is a consensus oriented approach (Becker et al., Schmid) A statement is true, if and only if it is accepted by a group.
 - > Need to understand this consensus and acceptance process
 - > How to test this statement beyond the group?
- Ahrweiler and Gilbert: do we get from simulation what we constructed it for? We constructed it for learning, for a shared representation.
 - > There is a need of evaluation of the learning process
 - > and assess the role of simulation in this learning process